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PATENT  
Attorney Docket No. 98124X205487  
Client Reference No. 98124

AF/1700

#23  
6/24/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:

Wang et al.

Application No. 09/636,161

Art Unit: 1765

Filed: August 10, 2000

Examiner: Lynette T. Umez-Eronini

For: POLISHING SYSTEM AND METHOD  
OF ITS USE

TRANSMITTAL OF  
APPELLANTS' APPEAL BRIEF

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

In accordance with 37 CFR 1.192, appellants hereby submit Appellants' Brief on Appeal in triplicate.

The items checked below are appropriate:

1. **Status of Appellants**

This application is on behalf of ☐ other than a small entity or ☒ a small entity.

2. **Fee for Filing Brief on Appeal**

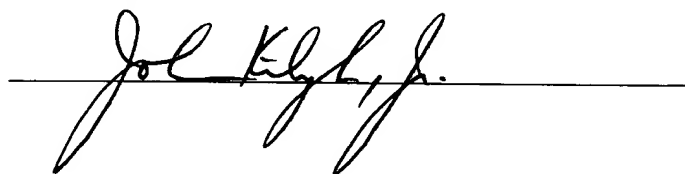
Pursuant to 37 CFR 1.17(c), the fee for filing the Brief on Appeal is for: ☐ other than a small entity or ☒ a small entity.

Brief Fee Due \$160.00

CERTIFICATE OF MAILING

I hereby certify that this document (along with any documents referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: June 16, 2003



**3. Oral Hearing**

☐ Appellants request an oral hearing in accordance with 37 CFR 1.194.

**4. Extension of Time**

☐ Appellants petition for a one-month extension of time under 37 CFR 1.136, the fee for which is \$110.00.

☒ Appellants believe that no extension of time is required. However, this conditional petition is being made to provide for the possibility that appellants have inadvertently overlooked the need for a petition and fee for extension of time.

**Extension fee due with this request: \$**

**5. Total Fee Due**

The total fee due is:

Brief on Appeal Fee	\$160.00
Request for Oral Hearing	\$ 0.00
Extension Fee (if any)	\$ 0.00

**Total Fee Due: \$160.00**

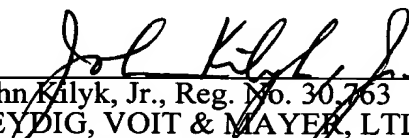
**6. Fee Payment**

☐ Attached is a check in the sum of \$

☒ Charge Account No. 12-1216 the sum of \$160.00. A duplicate of this transmittal is attached.

**7. Fee Deficiency**

☒ If any additional fee is required in connection with this communication, charge Account No. 12-1216. A duplicate copy of this transmittal is attached.

  
\_\_\_\_\_  
John Kilyk, Jr., Reg. No. 30,763  
LEYDIG, VOIT & MAYER, LTD.  
Two Prudential Plaza, Suite 4900  
180 North Stetson  
Chicago, Illinois 60601-6780  
(312) 616-5600 (telephone)  
(312) 616-5700 (facsimile)

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In re Application of:

Wang et al.

Art Unit: 1765

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For: POLISHING SYSTEM AND METHOD OF  
ITS USE

**APPELLANTS' APPEAL BRIEF**

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

The following comprises Appellants' Brief on Appeal in support of the appeal of the decision of the Examiner of Group Art Unit 1765 per the final Office Action dated January 14, 2003. A Notice of Appeal was filed on April 11, 2003, and received by the United States Patent and Trademark Office on April 17, 2003, thereby making the appeal brief due on June 17, 2003. This Brief is transmitted in triplicate (37 C.F.R. 1.192(a)).

*Real Party In Interest*

The patent application that is the subject of this appeal is assigned to Cabot Microelectronics Corporation.

*Related Appeals and Interferences*

There are no appeals or interferences that are related to this appeal.

*Status of Claims*

Claims 1-6, 8, 9, 16-27, and 32-35 currently are pending and are set forth in the Appendix attached hereto. Claims 1, 3-6, 8, 9, and 16-27 are rejected. Claims 32-35 are objected to as being dependent on a rejected base claim but are otherwise allowable. Claim 2 has been withdrawn from consideration by the Office as being drawn to a non-elected species.

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### *Status of Amendments*

No amendments have been filed subsequent to the final rejection.

### *Summary of Invention*

The present invention relates to a polishing system and composition for use in polishing a substrate, particularly a multi-layer substrate that includes a first metal layer and a second layer (see, e.g., the present specification at page 3, lines 25-26). In particular, the present invention provides a system for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising (i) a liquid carrier (see, e.g., the present specification at page 3, line 28 and page 4, lines 18-20), (ii) at least one oxidizing agent (see, e.g., the present specification at page 3, lines 28-29 and page 4, lines 21-34), (iii) at least one polishing additive that increases the rate at which the system polishes at least one layer of the substrate, wherein the polishing additive is selected from the group consisting of pyrophosphates, condensed phosphates, diphosphonic acids, tri-phosphonic acids, poly-phosphonic acids, phosphonoacetic acids, and salts thereof, aminoethylethanolamine, polyethyleneimine, amino alcohols, amides, imines, imino acids, nitriles, nitros, thioesters, thioethers, carbothiolic acids, carbothionic acids, thiocarboxylic acids, thiosalicylic acids, and mixtures thereof, (see, e.g., the present specification at page 3, lines 29-34 and page 4, line 4 – page 7, line 27) (iv) at least one passivation film forming agent (see, e.g., the present specification at page 10, line 28 – page 11, line 16), and (v) a polishing pad and/or an abrasive (see, e.g., the present specification at page 3, lines 34-35 and page 10, lines 24-34).

### *Issues*

The issue on appeal is whether the subject matter of claims 1, 3-6, 8, 9, and 16-27 is obvious under 35 U.S.C. § 103(a) over U.S. Patent 5,770,095 (Sasaki et al.) in view of U.S. Patent 5,783,489 (Kaufman et al.).

### *Grouping of Claims*

The appealed claims stand and fall together.

### *Argument*

The final Office Action alleges that the subject matter of claims 1, 3-6, 8, 9, and 16-27 is obvious under 35 U.S.C. § 103(a) in view of the combined disclosures of the Sasaki et al. and Kaufman et al references. In particular, the final Office Action relies on the Sasaki et al.

reference for its disclosure of a polishing agent comprising (i) water, (ii) an etching agent (e.g., an aminoacetic acid in combination with an oxidizing agent), (iii) a chemical agent which reacts with the substrate surface to form a protective film thereon (e.g., benzotriazole or an octanephosphonic acid), and (iv) an abrasive. The final Office Action relies on the Kaufman et al. reference for its disclosure of a polishing slurry comprising a diphosphonic acid, such as aminotri(methylenephosphonic) acid or 1-hydroxyethylidene-4-diphosphonic acid. The final Office Action alleges that it would have been obvious for one of ordinary skill in the art to substitute the diphosphonic acids disclosed in the Kaufman et al. reference for the phosphonic acids of the Sasaki et al. reference, thereby arriving at the invention defined by the appealed claims.

As is well-settled, in order to establish a *prima facie* case of obviousness, three basic criteria must be met: (a) there must be some suggestion or motivation to modify the reference or to combine reference teachings, (b) there must be a reasonable expectation of success, and (c) the prior art references must teach or suggest all the claim limitations. See, e.g., M.P.E.P. § 2143.

(a) There Is No Suggestion Or Motivation To Combine The Cited References

The Section 103(a) rejection is improper because there is no suggestion or motivation to combine the references in such a way as to arrive at the claimed subject matter. In order to set forth a *prima facie* case of obviousness based on a combination of references under Section 103(a), the Office Action must identify a “clear and particular” teaching, suggestion, or motivation to combine the references. *In re Demiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999), *abrogated on other grounds* by *In re Gartside*, 203 F.3d 1305, 1316, 53 U.S.P.Q.2d 1769, 1769-1770 (Fed. Cir. 2000); *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2d 1453, 1456 (Fed. Cir. 1998); *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1051, 5 U.S.P.Q.2d 1434, 1438 (Fed. Cir. 1988). As the Federal Circuit has stated, “combining prior art references without evidence of such a suggestion, teaching or motivation simply takes the inventor’s disclosure as a blueprint for piecing together the prior art to defeat patentability – the essence of hindsight.” *In re Demiczak*, 175 F.2d at 999.

In support of the Section 103(a) rejection, the final Office Action alleges that it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to substitute the diphosphonic acids of the Kaufman et al. reference for the phosphonic acids of the Sasaki et al. reference “because both compounds are considered equivalent: they are phosphonic acids” (page 3 of the final Office Action). The final Office Action further alleges that it would have been obvious for one of ordinary skill in the art to make the asserted substitution “for the purpose of promoting stabilization of the polishing slurry

against settling, flocculation, and decomposi[tion]” (page 3 of the final Office Action). An examination of the disclosures of the Kaufman et al. and Sasaki et al. references reveals that such a statement of “motivation” is not supported by the cited references and, in fact, is contrary to the express teachings of those references.

To the extent that the Sasaki et al. reference discloses a polishing composition comprising phosphonic acids, such phosphonic acids are selected from a group of “chemical agents forming a protection film by reacting” with the metal-containing substrate (see, e.g., Sasaki et al. at col. 3, lines 38-54). The Sasaki et al. reference further provides that the purpose for including such chemical agents is to *suppress* the removal of the metal-containing substrate (see, e.g., Sasaki et al. at col. 3, lines 18-22). By way of contrast, the Kaufman et al. reference only discloses the use of phosphonic acids as stabilizers, which are used to prevent settling and flocculation of the abrasive particles contained in a polishing composition (see, e.g., Kaufman et al. at col. 6, lines 49-59). Accordingly, the express teachings of the references plainly set forth the different functions of each class of phosphonic acids: film-forming agent (to *protect* substrate surface) versus stabilizer (for abrasive that *removes* substrate surface). Moreover, there is nothing within either of the cited references which teaches or suggests that the particular diphosphonic acids disclosed in the Kaufman et al. reference would function as the film-forming agent disclosed in the Sasaki et al. reference. Furthermore, one of ordinary skill in the art, at the time of invention, would not have expected the particular diphosphonic acids disclosed in the Kaufman et al. reference to function as film-forming agents. Thus, contrary to the Office Action’s assertions, the phosphonic acids of the Sasaki et al. reference and the diphosphonic acids of the Kaufman et al. reference would not have been treated as equivalent by one of ordinary skill in the art at the time of invention.

Therefore, in order to combine the references as suggested in the Office Action, one of ordinary skill in the art would have to ignore the explicit teachings contained within one of the cited references regarding the function of the phosphonic acid. In particular, one of ordinary skill in the art could only be motivated to substitute the diphosphonic acids of the Kaufman et al. reference, which function as stabilizers, for the phosphonic acids of the Sasaki et al. reference, which function as film-forming agents, by ignoring at least one of those express functions. However, a proper obviousness inquiry requires that the cited references be considered for all that they teach, *In re Gurley*, 27 F.3d 551, 553, 31 U.S.P.Q.2d 1130, 1131-32 (Fed. Cir. 1994), and portions of those teachings cannot properly be disregarded in searching for a motivation to combine the references. See M.P.E.P. § 2143.01 (noting that, in order to properly support a *prima facie* obviousness rejection, a proposed modification or combination cannot change the principle of operation of a reference).



## APPENDIX - PENDING CLAIMS

1. A system for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising (i) a liquid carrier, (ii) at least one oxidizing agent, (iii) at least one polishing additive that increases the rate at which the system polishes at least one layer of the substrate, wherein the polishing additive is selected from the group consisting of pyrophosphates, condensed phosphates, diphosphonic acids, tri-phosphonic acids, poly-phosphonic acids, phosphonoacetic acids, and salts thereof, aminoethylethanolamine, polyethyleneimine, amino alcohols, amides, imines, imino acids, nitriles, nitros, thioesters, thioethers, carbothiolic acids, carbothionic acids, thiocarboxylic acids, thiosalicylic acids, and mixtures thereof, (iv) at least one passivation film forming agent, and (v) a polishing pad and/or an abrasive.
2. The system of claim 1, wherein the liquid carrier is a nonaqueous solvent.
3. The system of claim 1, wherein the liquid carrier is water.
4. The system of claim 3, wherein the system comprises an abrasive suspended in the liquid carrier.
5. The system of claim 3, wherein the abrasive is fixed on the polishing pad.
6. The system of claim 3, wherein no abrasive is present in the system, and the polishing pad is a non-abrasive pad.
8. The system of claim 3, wherein at least one oxidizing agent is a peroxide, and at least one passivation film forming agent comprises one or more 5-6 member heterocyclic nitrogen-containing rings.
9. The system of claim 3, wherein at least one polishing additive is selected from the group consisting of ethylene di-phosphonic acid, 1-hydroxyethylidene-1,1-di-phosphonic acid, and a mixture thereof.

16. The system of claim 9, wherein at least one oxidizing agent is a peroxide, and at least one passivation film forming agent comprises one or more 5-6 member heterocyclic nitrogen-containing rings.

17. The system of claim 3, wherein at least one polishing additive is both (a) a compound selected from the group consisting of pyrophosphates, condensed phosphates, phosphonic acids and salts thereof, and (b) a compound selected from the group consisting of amines, amino alcohols, amides, imines, imino acids, nitriles, and nitros.

18. The system of claim 3, wherein at least one polishing additive is both (a) a compound selected from the group consisting of amines, amino alcohols, amides, imines, imino acids, nitriles, and nitros, and (b) a compound selected from the group consisting of thioesters, and thioethers, carbothiolic acids, carbothionic acids, thiocarboxylic acids, and thiosalicylic acids.

19. The system of claim 17, wherein at least one polishing additive is selected from the group consisting of 2-aminoethyl phosphonic acid, amino(trimethylenephosphonic acid), diethylenetriaminepenta(methylenephosphonic acid), hexamethylenediaminetetra(methylene phosphonic acid), and mixtures thereof.

20. The system of claim 3, wherein the system further comprises a source of ammonia.

21. The system of claim 20, wherein the system comprises (i) aminotri-(methylenephosphonic acid) and (ii) ammonia or an ammonium salt.

22. The system of claim 3, wherein the system further comprises at least one stopping compound.

23. The system of claim 3, wherein the system further comprises at least one polymeric compound that reduces the polishing rate of at least one layer associated with the substrate.

24. The system of claim 3, wherein at least one passivation film-forming agent is selected from the group consisting of 1,2,3-triazole, 1,2,4-triazole, benzotriazole,



benzimidazole, benzothiazole, and hydroxy-, amino-, imino-, carboxy-, mercapto-, nitro-, urea-, thiourea-, or alkyl-substituted derivatives thereof

25. The system of claim 3, wherein the abrasive is a metal oxide abrasive.
26. The system of claim 25, wherein the abrasive is selected from the group consisting of alumina, ceria, germania, silica, titania, zirconia, and coformed products thereof, and mixtures thereof.
27. The system of claim 26, wherein the abrasive is alumina.
32. The system of claim 1, wherein at least one polishing additive is iminodiacetic acid.
33. The system of claim 32, wherein the system further comprises at least one stopping compound.
34. The system of claim 32, wherein the system further comprises at least one polymeric compound that reduces the polishing rate of at least one layer associated with the substrate.
35. The system of claim 22, wherein the system further comprises ammonia or an ammonium salt.

Moreover, the Sasaki et al. reference fails to teach or suggest the need for a stabilizer to prevent settling and flocculation of the abrasive particles. In fact, the Sasaki et al. reference fails to even mention settling or flocculation, much less teach or suggest that the abrasive particles contained in the polishing composition are, or can become, colloiddally unstable. Therefore, nothing within the Sasaki et al. reference would have motivated one of ordinary skill in the art to look to any reference, much less the Kaufman et al. reference, for additional phosphonic acid film-forming agents or stabilizers. Indeed, any supposed motivation to combine the cited references based upon the benefits of incorporating a stabilizer into the composition of the Sasaki et al. reference can only be realized once the individual elements of the invention have been found in the prior art. However, such piecemeal culling of the prior art merely constitutes an improper hindsight reconstruction of the subject invention, which reconstruction has no place in a proper obviousness inquiry.

In view of the fact that the distinct phosphonic acids of the Sasaki et al. and Kaufman et al. references are used for completely different purposes, and in view of the fact that the disclosure of the Sasaki et al. reference lacks any suggestion regarding the need for a stabilizer, one of ordinary skill in the art would not have been motivated to combine the references, except with improper hindsight of the present invention.

(b) There Is No Reasonable Expectation of Success

Even if the ordinarily skilled artisan were provided with the combination of the Sasaki et al. and Kaufman et al. references, such artisan would not have reasonably expected the combination to succeed. As noted above, the Sasaki et al. reference only discloses the use of phosphonic acids as film-forming agents. To that end, the phosphonic acids comprise a long, saturated alkyl chain, which renders the molecule hydrophobic and enables it to protect the surface of the metal-containing substrate from the chemical action of the aqueous polishing composition (see, e.g., Sasaki et al. at col. 3, lines 17-24). By way of contrast, the particular phosphonic acids disclosed in the Kaufman et al. reference act as stabilizers for the abrasive particles contained in the polishing composition. As such, the disclosed phosphonic acids comprise short alkyl chains which are substituted with polar functional groups (see, e.g., Kaufman et al. at col. 6, lines 49-55). These short alkyl chains and polar functional groups render the molecules hydrophilic, allowing them to remain in the aqueous phase of the polishing composition where they interact with the surface of the abrasive particles, thereby preventing settling or flocculation of the abrasive particles. Thus, in view of the functional and structural differences between the phosphonic acids disclosed in the Sasaki et al. and Kaufman et al. references, one of ordinary skill in the art, at the time of invention, would not have expected the combination of the two references to succeed.

More specifically, one of ordinary skill in the art would not have expected the hydrophilic phosphonic acids of the Kaufman et al. reference to function as the film-forming agent called for in the Sasaki et al. reference. Indeed, having read the Kaufman et al. reference, one of ordinary skill in the art would have expected the particular phosphonic acids disclosed in the Kaufman et al. reference to be “consumed” by interactions with the abrasive particles contained in the polishing composition, leaving little to nothing to interact with the substrate surface. Moreover, one of ordinary skill in the art would not have reasonably expected the hydrophilic phosphonic acids disclosed in the Kaufman et al. reference to effectively protect the substrate surface from the chemical action of the aqueous polishing composition. It would have been more reasonable to expect that such hydrophilic phosphonic acids would have accelerated, rather than inhibited, the chemical action of the aqueous polishing composition. Indeed, as can be seen from Examples 1, 3, 4, 5, and 6 of the specification of the present application, the addition of a polyphosphonic acid similar to those disclosed in the Kaufman et al. reference *substantially increases* the polishing rate of a polishing composition, as opposed to inhibiting the polishing rate as required by the Sasaki et al. reference. Accordingly, one of ordinary skill in the art, at the time of invention, would not have reasonably expected the combination of the disclosures of the Sasaki et al. and Kaufman et al. references to succeed.

(c) The Cited References Do Not Teach or Suggest All the Claim Limitations

The cited references, when combined as suggested in the final Office Action, fail to teach or suggest all the elements of the invention as recited in the appealed claims. As noted above, the Sasaki et al. reference discloses a polishing agent comprising (i) water, (ii) an etching agent, (iii) a chemical agent which reacts with the substrate surface to form a protective film thereon, and (iv) an abrasive. Thus, as acknowledged in the Office Action, the Sasaki et al. reference fails to teach or suggest a polishing additive as recited in the appealed claims. The Office Action then alleges that it would have been obvious for one of ordinary skill in the art to substitute the diphosphonic acids of the Kaufman et al. reference for the film-forming agent of the Sasaki et al. reference. However, as noted above, the diphosphonic acids of the Kaufman et al. reference do not function as film-forming agents. In particular, the relatively short alkyl chains and polar functional groups comprising the diphosphonic acids of the Kaufman et al. reference render the diphosphonic acids hydrophilic, which prevents those diphosphonic acids from depositing on the metal-containing surface and reacting to form a protective film thereon. Thus, when the cited references are combined as suggested in the Office Action, the film-forming agent of the Sasaki et al. reference is eliminated in favor of a hydrophilic diphosphonic acid, which is


incapable of acting as a film-forming agent - - a required element of the appealed claims. Accordingly, the suggested combination of references fails to teach or suggest all of the elements of the invention as recited in the appealed claims.

For the foregoing reasons, the Patent Office has not made out a *prima facie* obviousness rejection. The Patent Office has not shown a clear and particular suggestion or motivation in the prior art to combine the disclosures of the cited references, let alone that such a combination would necessarily result in the claimed invention, which would be reasonably expected by one of ordinary skill in the art to function successfully. Accordingly, the Section 103(a) rejection is improper and should be withdrawn as to all the appealed claims.

*Conclusion*

In view of the above, Appellants respectfully urge that the Examiner's rejection be reversed.

Respectfully submitted,

  
\_\_\_\_\_  
John Kilyk, Jr., Reg. No. 30,763  
LEYDIG, VOIT & MAYER, LTD.  
Two Prudential Plaza, Suite 4900  
180 North Stetson  
Chicago, Illinois 60601-6780  
(312) 616-5600 (telephone)  
(312) 616-5700 (facsimile)

Date: June 16, 2003